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Soil Conservation
25 Years Ago

"A program designed to change an exploitative or speculative type of agriculture to one of stability and permanence must take into account all factors relating to the use of the land. It must involve in particular the physical features of the soil, including the degree and rate of erosion for each field and parcel of land. It must include careful studies of the capabilities of each field and parcel of land for the production without accelerated erosion of cultivated crops, pasture, permanent hay, woodland, and wildlife. The best species and strains of plants must be determined, not only from the standpoint of production but from the standpoints of persistence, and erosion-control and soil-building values. The safest and most effective practices relating to water conservation are of utmost importance; and proper fertilization, tillage, harvesting, handling of crop residues, grazing, and mechanical measures for the control of run-off must be put into operation on a permanent basis. Extremely important also is close consideration of the economic and social statuses and needs of farmers and operators."

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COVER PICTURE.—The effectiveness of conservation farming in controlling costly wind erosion is shown graphically in this picture taken in Cascade County, Mont., in February 1960. The strip-cropped fields at left and right are safely anchored against the wind that literally is blowing away the unprotected field in between.—Photo by Merle B. Brunsvold.

Soil Conservation

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FRANK B. HARPER, Editor

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Great Plains Profits in '60's From "Dust Bowl" of the 30's

By Cy Luker

PEOPLE of the periodically drought-plagued Great Plains are restoring the land face of this vast and fertile farm belt extending across the 10 mid-continent States from North Dakota to Texas. Farmers and ranchers, townspeople, and local, State, and Federal governments are working this magic in the Nation's longtime "breadbasket" through cooperative land-use and water-management conservation undertakings.

Today's national action program of soil and water conservation came about in the first place as a result of the great Plains drought in the 1930's, that sent wind-eroded soil dust drifting across the continent past the national capitol dome and out over the Atlantic Ocean in May 1934, and again in March 1935. That was while Congress was considering legislation to establish the Soil Conservation Service as a permanent agency in the Department of Agriculture for carrying on erosion control and related activities begun in 1933 by the Soil Erosion Service.

With this further dramatic impetus, the law setting up national policy on and machinery for Federal technical and other help in dealing with wind and water erosion, flood prevention, and allied land and water resource problems was enacted on April 27, 1935, as Public 46 of the 74th Congress.

The author was formerly assistant to the Administrator, in charge of the Great Plains Conservation Program, Soil Conservation Service, Washington, D. C. (See *Soil Conservation*, November 1961.)

Man's battle against the vagaries of Nature and the ravages of

Cy Luker.

his own plows in wholesale sod breaking for grain growing in the 1920's was on in earnest in the 600-800-mile wide, windswept trough between the Rocky Mountains on the west and the 100th meridian roughly dividing the Great Plains from the humid Corn Belt on the east. But, as those of us can testify who were recruited within a month or two to expand the organization of wind erosion control demonstration projects in cooperation with farmers and ranchers and with State agricultural agencies, the war against the destructive forces of wind erosion was not to be a short one easily won.

For many years it has been recognized that the hazards of climate, variable soil conditions, and economic factors combined often have made agricultural production uncertain in this area. The Great Plains Agricultural Council, over a period of 20 odd years' study, advised on the need for more careful consideration and treatment if periodic adversity was to be reduced. Out of this background of practical experience and professional study and discussion came greater emphasis upon proper land use and accelerated application of needed soil and water conservation measures by people on the land, with the best help that could be supplied through State colleges, farm organizations, Federal agencies, and others.

Landowners and government together chiseled away on different faces of the Great Plains problem. Programs initiated during the 1930's and 1940's included, also, shelterbelt tree planting, Water Facilities Act developments, Farm Forestry Act plantings, Land Utilization Program conversion of government-purchased "marginal" cropland to grass, and the forerunners of the present cost-sharing Agricultural Conservation Program.

The big breakthrough came when farmers and ranchers began in 1937 to form their own soil conservation districts under State enabling acts and went at the job on a concentrated area or community basis. But even while these districts were perfecting their plans and getting their programs started, with technical and financial help from all available sources,

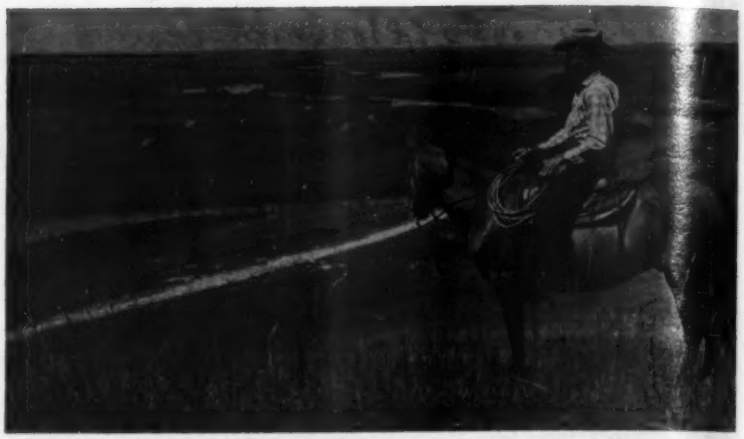
there was another big plow-up of sod, from 1942 to 1950, in many Plains areas.

This plow-up — inspired by World War II demands for wheat and other food, livestock feed, and fiber crops that the "new" land could produce in abundance in those years of favorable moisture —did not compare to that of the late twenties; but several million acres of sod were plowed. Most of it was on the western fringes of the old "Dust Bowl," where the normal rainfall is least, and the rest was largely on poor land. At the same time, there was several million acres more of poor land that had been plowed during the twenties that, abandoned in the late thirties, again was being cultivated in the forties. Such poor land in the drier sections usually is first to start blowing and blows the worst.

In the 1950's the Great Plains again found itself in one of its worst droughts—some said worse than the one in the 1930's. Rainfall was 200 percent below normal in parts of the drought area. Crops failed year after year, and Federal and State emergency funds were allocated to help livestockmen buy hard-to-get hay for their herds. Dust from still unprotected fields again came blowing out of the Plains—this time as far as deep Midwestern cities, but not across the entire country to Washington as before.

Because of lessons already learned, landowners and operators and the entire Great Plains area fared better than in the 1930's. There was less damage to cropland and ranges, less farm abandonment, and less human suffering. And when the drought was over in 1957, the comeback was quicker, thanks in large measure to research and experience that had been gained in soil and moisture conservation farming.

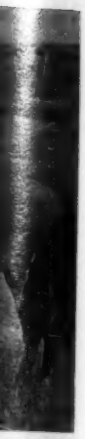
Widespread appreciation of the necessity for careful land use and water management was reflected in



Neal Keller's plan has balanced operations on his North Loup River ranch in Nebraska's Cherry SWCD—good grass plus winter feed plus abundant water.

Grass, and water for its fullest use by livestock, is a primary objective of today's Great Plains conservation programs. This large, permanent stock pond is on the Sidney Hauge farm near Crosby, N. Dak.

Lining irrigation ditches like this one that supplies 80-acre field for R. A. Howard in the Nueces-Frio Sabinal SWCD in Uvalde County, Tex., is one of today's conservation measures that save water and stabilize land use.



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the fact that 469 soil conservation districts had been organized in the 422 Great Plains counties proper by June 30 that year. Their more than 386,000 operating units included 352 million of the 386-⅓ million acres in that area. Many landowners and communities likewise were prompt to make use of the Watershed Protection and Flood Prevention Act which in 1954 authorized local-State-Federal cooperation in developing small-watershed and flood prevention projects.

The drought in the fifties, however, pointed up the urgency of moving ahead still faster with measures to minimize the climatic and other hazards of farming and ranching in the Plains. There was need to bring about greater agricultural stability through cropping and grazing systems, land-use changes, and the application of enduring soil and water conservation practices. A specially tailored Great Plains Conservation Program was enacted in 1956, through which landowners receive Federal payments for fulfilling contracts to plant cropland to grass and carry out other practices. This program, administered by the Soil Conservation Service, supplements other land-use programs, and participants' plans are reviewed by soil and water conservation district supervisors.

Now in the middle years of its projected 15-year span, the Great Plains Conservation Program already has to its credit about 13,000 contracts covering conservation plans on farms and ranches, and workable time tables for carrying them out under about $10 million annual appropriations for the 1958 to 1962 fiscal years, $12-⅓ million for 1963, and about $13.6 million for the current 1964 fiscal year. Program participants are paying about 54 percent of their investment out of their own pockets.

GPCP plans cover nearly 30 million acres in 387 program-designated counties. In line with the program's primary attention to the "land that should never again be plowed," nearly 1 million acres, or 23 percent of the cropland involved in the planning to date, has gone into grassland use or is going into grass. Reseeding of rangeland is the next most extensive practice being Great Plains Conservation Program cost-shared, supported by brush control, stockwater developments, and other grassland treatment measures.

Limited cost-sharing also is provided for developing or improving irrigation systems needed to help production of stock feed, as it also is for other water conservation measures such as water spreading for hay crops. The GPCP also has stimulated farmers' and ranchers' use of soil-protecting stubble mulch tillage on millions of acres of cropland and grazing management within grassland's safe carrying capacity, though neither of these practices is cost-shared.

The comparative ease with which farmers and ranchers using soil and water conservation district and Great Plains Conservation Program plans went through the 1963 drought in different parts of the Plains supports a growing belief that this important agricultural area's economy will not suffer again from devastating "black blizzards" or another dust bowl. Meanwhile, the Plains is providing a working example of Rural Areas Development at its best, in improved economic stability of rural families and of communities small and large, through land-use adjustment and conservation treatment that at the same time cut down on acreages of crops presently produced in oversupply. And the influence of these accomplishments is being felt far beyond the Great Plains, with other major areas having common land-use problems watching closely the success of what actually still is the "pilot" Great Plains Conservation Program.

Districts Meet On Broad Problems

Secretary of Agriculture Orville L. Freeman and Governor William W. Scranton of Pennsylvania were among speakers headlining the scheduled 5-day working program of the National Association of Soil and Water Conservation Districts' 18th annual convention at Kansas City, Mo., February 2 to 6.

In addition to those respective Tuesday luncheon and Wednesday banquet speakers were four authorities on agricultural and related resources at the general session on Wednesday, February 5: President Charles B. Shuman of the American Farm Bureau Federation, Director Henry L. Ahlgren of the University of Wisconsin Extension Service, Director Edward C. Crafts of the U. S. Department of Interior's Bureau of Outdoor Recreation, and Vice-president C. R. Gutermuth of the Wildlife Management Institute. Presentation of the annual report by President Marion Monk of Louisiana, highlighted Monday's opening general session program.

The broad range of resource conservation problems and activities involved in today's rural area development and community planning was reflected further in the agenda of the various committees: including industry relations, rural-urban affairs, shore erosion, the Great Plains, soil stewardship, watersheds and water resources, youth programs, public lands, and recreation and wildlife.

This year's meeting was for officers and cooperators representing nearly 3,000 conservation districts, covering 93 percent of the Nation's farmland and 97 percent of its farms, and by their affiliated Ladies Auxiliary members headed by Mrs. Oscar Hippe of Montana. About 1,500 attended. The Association's first annual meeting, attended by only 18 district leaders, was held in Chicago, Ill., in July 1946.

Metropolitan East Has Wind Erosion Too

By John A. Krohn and Vernon E. Johnson

THREAT of wind erosion damage to food crops and lands which produce them is no farther away from the Nation's leading Boston-New York-Philadelphia area of population concentration than the important vegetable and fruit sections of southern New Jersey or the vegetable- and tobacco-growing Connecticut River Valley in Massachusetts.

Serious wind erosion has been brought under control in the flood plain of the Connecticut River by growers working through their soil conservation districts, but they have to continue practicing careful soil and moisture management to keep wind damage from recurring. South Jersey farmers similarly are keeping at their windbreak plantings and other measures that help keep their lands producing for the metropolitan food markets.

This is not a Great Plains "dust bowl" scene, but soil blowing in 1948 on unprotected fields in Atlantic County, N. J.

This 6-yr.-old privet windbreak hedge and the rye cover crop in foreground are typical wind erosion control measures in Burlington County, N. J.

It once was common in the Connecticut River Valley to have duststorms so severe that it was necessary to use automobile headlights at midday when driving past cultivated fields. When the Hampden, Hampshire, and Franklin County soil conservation districts which cover the valley were established in 1946-47, wind erosion was considered a No. 1 problem.

Agriculture in the Connecticut Valley is mainly one of cash crops: tobacco, onions, squash, asparagus, potatoes, corn, and cucumbers, with a small amount of dairying. There are many small owners with holdings of only a few acres.

In the conventional cropping pattern formerly followed no grasses or legumes were grown. As a result of this continuous cultivation, the natural crumbly structure of the fine sandy or silt loam soil was destroyed, and it became highly susceptible to wind action. Also, sand whipped along the surface of the ground by the wind cut off the tops of young onion sets and caused blast injury to asparagus tips.

A joint program to control the wind erosion was developed with the help of the Extension Service, the Agricultural Stabilization and Conservation Service, the Soil Conservation Service, and the soil conservation districts. The benefits of

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The Connecticut River Valley as seen from Mount Sugarloaf in Sunderland, Mass.

cover crops were explained in demonstrations, talks, and publications —including one called "Let's Keep the Soil Out of the Kitchen."

Farmers began growing cover crops of either rye, wheat, or field brome, until all but a very few acres of the valley now are tied down every fall. The cover crops control wind erosion while improving the physical condition of the soil. There still is a small problem when regular crops are taken off the land late in the season. Some farmers, for example, now are even considering cover crops in their late cabbages.

Southern New Jersey growers, meanwhile, have turned to hedge windbreaks to stop wind erosion damage to their fields and crops. They have planted up to 5 miles of privet hedges a year in Atlantic and Cape May counties in the Cape-Atlantic Soil Conservation District, which arranged to step up its windbreak campaign by encourging fall plantings in addition to the usual spring distribution of 2-year-old rootstock.

Local farm operators can testify to how bad soil blowing has been, and to the success of their wind erosion control efforts. One, SCD Supervisor Angelo Bylone, at East Vineland, has a half-mile of 15-foot-high California and Amur River North privet protecting his 35 acres of sweet potato land. He reported that his privet, now 10 years old, saved him at least $1,500 potential loss in a 20-acre planting of sweets one spring alone.

Tom Rizzotte, operator of "Pine View Orchards Farm" at Hammonton, figures that his mile and a half of hedge windbreaks have saved him entire crops of sweet potatoes and tomatoes, as well as saving fruit from damage in the first several rows of orchard trees on the windward side. He recalls when "dust piled up on windowsills inside the house" and "I'd get so blinded driving the tractor, I'd have to quit."

Farmers from Hammonton to the Cape agree that privet gives wind-protection all year long soon after planting, with maximum protection within 7 or 8 years at a height of 12 to 15 feet. Farmers also have found that privet hedges attract insect-eating birds and other wildlife; they require minimum care; and they take little land out of cultivation and draw little moisture from adjoining fields. The windbreaks also form boundaries for the farm.

Sand dune stabilization also is an important wind erosion control job in New Jersey's major Atlantic coastal resort areas, as it is on the Delaware and Maryland shores and elsewhere. Native and improved American beachgrasses are used for permanent dune protection; but, particularly after destructive storms like that in March 1962, picket-type fences or brush barriers are put up to trap sand until damaged dunes are rebuilt to the best height for giving protection against future storm tides and waves.

The New Jersey and other beach resorts provide recreation for much of the same heavily populated area that depends upon southern Jersey's sandy inland areas for vegetables and fruit, dairy and poultry products. Dune restoration and stabilization through local, State, and Federal cooperative efforts in the 2 years since "the big storm" have proved effective to the satisfaction of beach property owners and visitors alike.

Wind Erosion Laboratory Finds Answers

By N. P. Woodruff

WIND erosion studies conducted since 1948 by the Agricultural Research Service in cooperation with the Kansas Agricultural Experiment Station have contributed importantly to the effectiveness of today's conservation and other advanced farming methods in reducing if not eliminating the threat of future "dust bowls" in the Great Plains.

One of the best testimonials to that fact was farmers' experience in Kansas itself during a drought in the mid-1950's, which records show was about as bad as that of the 1930's. Erosion of soil by wind was not nearly as serious as it was 20 or 25 years earlier.

One reason for this improvement is that farmers, through their conservation programs, by the 1950's had better "know how," and also had better equipment to till the soil, to plant, and to harvest. But another reason, and one which probably contributed to the first, is that research already was giving us a better understanding of the mechanics of wind erosion and of methods of control.

Wind erosion causes costly damage to millions of acres of land in the United States each year. It occurs in regions where the weather is characterized by (a) generally low and variable precipitation, (b) extremely variable and high wind velocity, (c) high frequency of drought, (d) rapid and extreme changes in temperature, and (e) high evaporation rates. Regions with such characteristics include, first, the Great Plains, the Columbia River Basin, parts of the Pacific Southwest, the Colorado Basin, the muck and sandy soils area around the Great Lakes, and the Gulf and Atlantic Seaboards.

In the Great Plains, about 35 percent of the land is cultivated, and the rest is used for forest, grass, or miscellaneous purposes.

Tree shelterbelts evaluated by (top) using models in wind tunnel and (bottom) measuring benefits in field.

Reliable estimates indicate that 90 percent of the wind erosion occurs on the cultivated land. Thus, the solution to the problem seems simple: Use vegetative cover—Nature's method—to stop wind erosion. Man has not been able yet to find a better way, but, unfortunately, the solution is not so simple.

We must cultivate the land to produce food and fiber. Such cultivation pulverizes the soil and leaves insufficient vegetation for its protection. Wind erosion then becomes a serious problem. Therefore, special ways compatible with producing food and fiber must be developed to control the erosion, through research and application of its findings on the land.

Despite advances made so far in research, there are many phases of this most complicated process of wind erosion that are not yet clearly understood. For example:

Research to date has shown us the important factors that influence the amount of wind erosion that will occur from a given agricultural surface under a given set of conditions. These factors can be put within the framework of a so-called "universal erosion equation," which permits general answers on what practices to use to control erosion. However, there are serious gaps still to be filled before we can answer specific questions.

Awareness of this need recently has prompted the Department of Agriculture and Kansas State University to expand the facilities for soil erosion research at Manhattan, Kans. A new laboratory has been built and equipped with a larger wind tunnel and a raindrop tower. The tower, in addition to the tunnel, will permit more detailed and basic investigations into combined wind and water erosion. Wind and water erosion processes are characterized and governed by many of the same basic principles.

The primary purposes of wind erosion research are to gain an understanding of the mechanics of erosion of soil by wind and to devise methods of its control. To accomplish these objectives, the sciences of physics, meteorology, engineering, mathematics, and statistics all are used. Thus: To learn more about the mechanics of

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erosion, wind structure is studied; velocity profiles over different agricultural land surfaces are measured and analyzed; the aerodynamic forces of lift and drag are measured; gustiness and turbulence studies of the wind are made, with sensitive strain-gage and hot-wire anemometers; and probability analyses of long-time wind velocity and direction records are made to develop prediction equations, and to determine prevailing wind erosion directions. Other climatic varibles, such as precipitation and temperature, also are studied; and their effects are integrated with wind velocity into a single climatic factor which denotes the influence of climate on wind erosion.

The soil likewise is studied in great detail: Studies are made of the influence of soil texture and aggregation; threshold velocities to initiate soil movement are determined in laboratory wind tunnels; rates of erosion in relation to length of field and velocity of wind are measured, using specially designed soil catchers and velocity measuring instruments; effects of abrasion on plants and soil clods and crusts are evaluated; and high-speed photography is used to study movement of soil grains in suspension, saltation, and surface creep —the three methods of soil movement by wind.

The dust load of the atmosphere during duststorms also is measured and is studied in relation to visibility and wind velocity, to determine the rates of its movement from one place and its deposition in other locations. Also, detailed wind tunnel investigations are made of the influence of surface roughness.

To devise methods to control wind erosion, the effects of kind, amount, and orientation of plant growth and residue are studied in laboratory and portable wind tunnels. Various methods of treating soils with chemicals and byproducts of the petroleum industry, such as asphalts, to increase aggregation and to form erosion-resistant surface films are studied, as are effects of different tillage implements on residue management and soil structure.

Stripcropping is studied, to determine the best width and spacing of strips. Various methods of surface roughening and clod formation by emergency tillage are studied. The benefits derived from barriers, including artificial devices, rows of annual crops, and shelterbelts, are studied, both in wind tunnels by using models and under natural conditions. Various types of trees, shrubs, and annual plants are tested to evaluate their potential for forming shelterbelts under semiarid conditions.

In a continuing effort to obtain more basic knowledge of wind erosion and to provide more specific guidance to farmers and soil conservationists alike, research effort during the next few years will be concentrated on the following specific problems:

INSIDE.—Laboratory wind tunnel for studying mechanics of wind erosion.

OUTSIDE.—Portable wind tunnel measures erodibility of stubble mulched land.

(1) Evaluating aerodynamic forces on the ground surface; (2) analyzing airflow, temperature, and evaporation patterns in the vicinity of shelterbelts and other types of barriers; (3) studying the composition and amount of atmospheric dust deposition; (4) determining erosion tolerances; (5) continuing analyses of tillage implement effects on residue management and soil structure; (6) testing trees and shrubs in the field to evaluate shelterbelt potential; and (7) studying ways to improve the wind erosion equation, including determinations of surface roughness after tillage with different implements, evaluations of the prevailing wind erosion direction throughout the United States, determinations of the wind erodibility factor for different soil groups, and computations of short-period climatic factors.

No. 73

This is the seventy-third of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

Farmers and Conservationists Apply Research Findings

By Edward R. Weimer

FARMERS and conservationists from North Dakota to Texas are making more use each year of basic information developed by the Agricultural Research Service's wind erosion laboratory at Manhattan, Kans., and correlated with studies and observations by State experiment stations and other sources.

Even though the factors contributing to wind erosion still prevail — frequent recurrence of drought, strong winds during late winter and early spring, and rather extensive areas where fallow or other cultural operations leave soils unprotected—the losses have been progressively reduced, because of better understanding of the problems and better land use and farming methods. These have resulted largely from application of principles, practices, and measures tested by research, advocated by the Soil Conservation Service, and proved out in the year-by-year experience of landowners and operators in their soil and water conservation districts' Agricultural Conservation, Great Plains Conservation, and other programs.

The author is conservation agronomist, Soil Conservation Service, Bismarck, N. Dak.

As set down by the late Dr. W. S. Chepil, for many years in charge of the Manhattan laboratory, the causes of wind erosion are few and simple:

Soil erosion results when strong winds blow across large, unprotected fields with smooth, bare surfaces and loose, dry, and finely granulated soils. By the same token, erosion can be reduced by keeping soil firm and moist; creating soil aggregates, or clods, large and stable enough to resist movement or abrasion by wind; roughening the surface; maintaining vegetative cover (living or dead) on the land; reducing the size or width of fields; arranging fields at right angles to the direction of damaging winds; and reducing the velocity of wind near the ground surface by placing barriers across the path of the wind.

Four neighboring farmers planted 26 miles of single-row pattern type field windbreaks like these 2-yr.-old trees on Ed Flanagan farm near Bismarck, N. Dak.

From the results of the research studies, a "universal wind erosion equation" was developed and is used as a guide to control methods in the different States to help predict susceptibility of fields to wind erosion and to define the necessary controls to reduce this susceptibility. Continuing research has been conducted to evaluate and refine the various factors in the equation, which follows:

$$E=IKCLV$$

This is a symbolic way of saying that a field's susceptibility to wind erosion (E) depends on five factors represented by other letters as follows:

I=Soil cloddiness factor—ratio between erodible and nonerodible soil aggregates.

K=Ridge roughness equivalent —how rough or how smooth the soil surface is.

C=Wind velocity and surface moisture factor—local climatic factors relating to wind erosion.

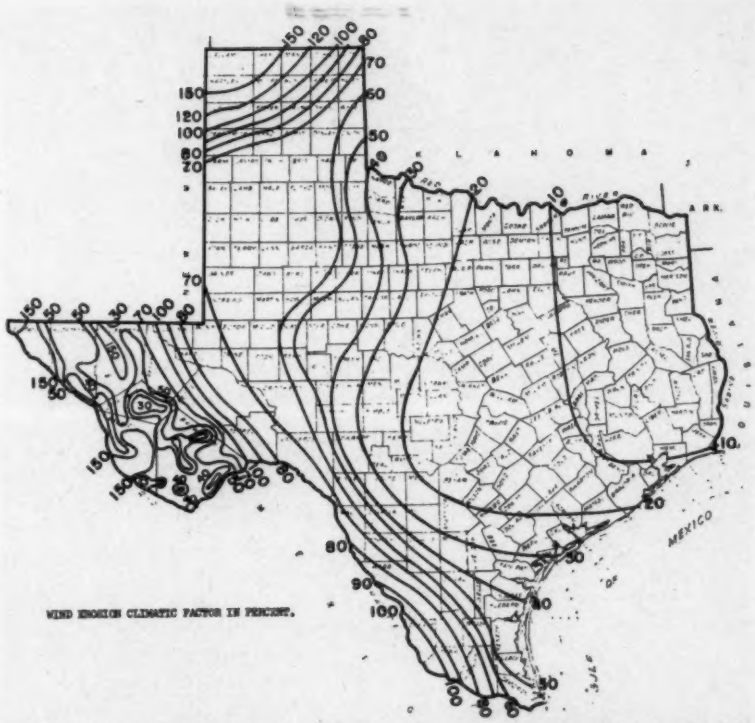
L=The unsheltered distance across the field along the prevailing erosive wind direction.

V=The quantity and kind of plant cover (living or dead) on the surface of the soil.

Many years of investigation were needed to identify and establish means of measuring these factors. Through controlled conditions, using laboratory and portable field wind tunnel equipment, research workers have been able to measure the amount of wind erosion that occurs and determine the effect of changing the various factors that influence it. After field evaluation studies were conducted to adjust research findings to actual field conditions, researchers were then able to assign values to the various factors and to relate their effects to varying conditions.

Development of the "Universal Equation" has afforded the Soil Conservation Service a valuable tool for conservation planning, in the North Dakota and the other Great Plains States. Conservationists now can replace generalized observations or estimates of field erodibility with rather reliable quantitative measurements. With this knowledge, they then are able to design measures to reduce or control erosion.

Adaptation of the equation to North Dakota conditions, to illustrate, was a three-step process: The first step was to evaluate the various factors under North Dakota conditions, make interpretations and correlate our conditions to the basic research, and then assign values for each factor to fit field conditions in this area. The second step was to place the various soils into interpretative groupings, based upon information gathered in step No. 1. As the third step, standards and specifications for the wind erosion control practices were developed, based upon the assumptions and criteria developed in steps one and two.



Wind erosion climatic factor for Texas, expressed as percent of that at Garden City, Kans., combines effects of wind velocity, precipitation, temperature, and evaporation, and indicates relative amount of wind erosion that would occur if all other influencing conditions were equal. Similar factors are available for all Great Plains States.

Many field tests and evaluations were conducted to determine the relative wind erodibility for fields on which the different soils were found. These studies showed a close relationship between the soil-clodiness factors (I) and soil textural classes, water table structure, organic matter content, and calcium carbonate content of the soils, as well as their variation throughout the year.

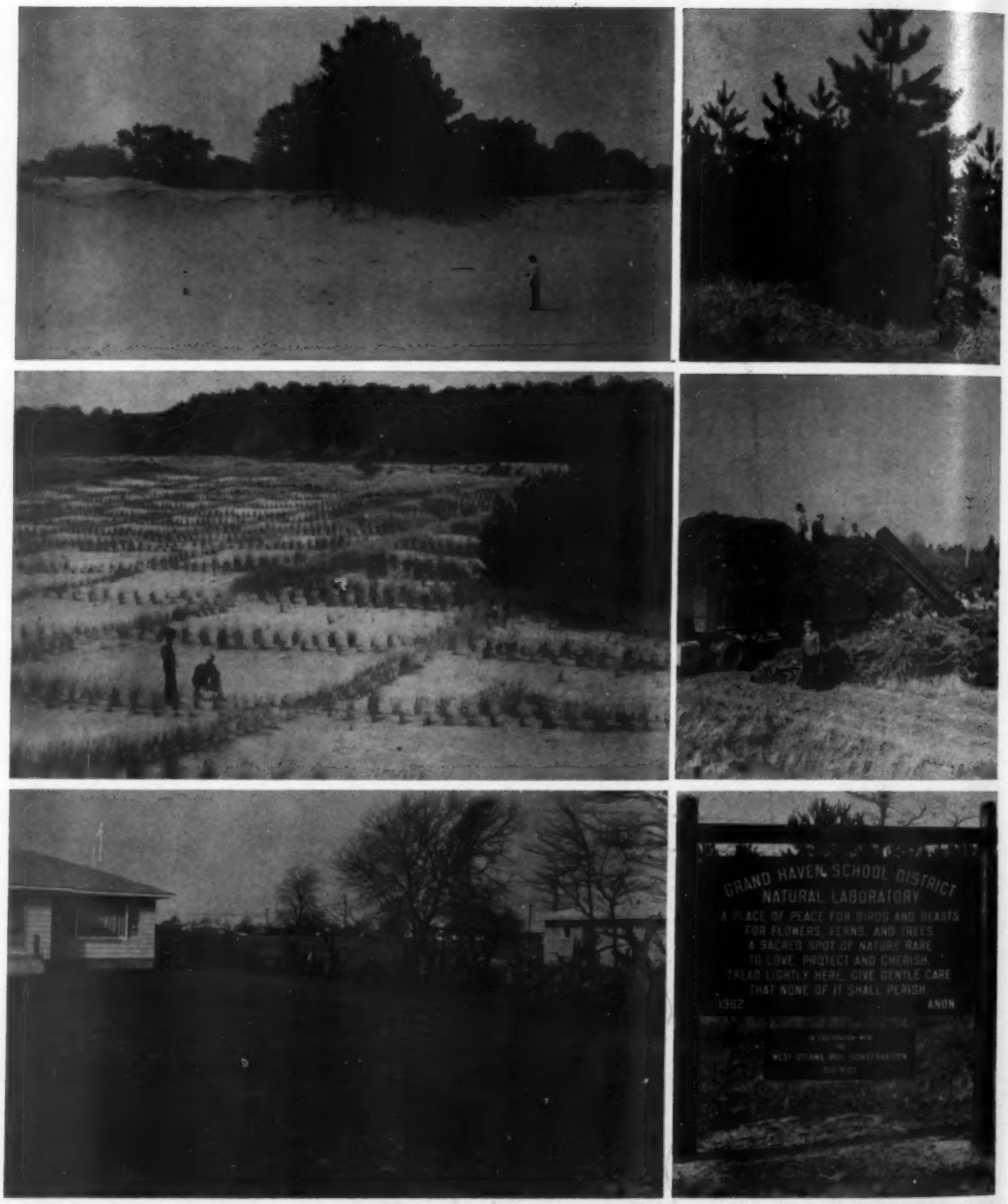
In conjunction with those evaluations, guidance was given in the field in determining the amounts of surface cover (V) and roughness (K) factors.

Determining local climatic factors (C), next involved a study of weather station records. The climatic values established help us understand the influence of local wind velocity and surface soil-moisture conditions on wind erosion and prevailing wind direction for various locations in the State.

Finally, values for field widths and the effect of wind barriers (L) were established.

Design criteria for wind erosion control practices are based upon wind velocities of 40 miles an hour at 50-foot elevation; because only a minor proportion of our winds exceeds this velocity, and it was felt that practical control could be designed for velocities to 40 miles an hour. Erosion control specifications also are designed to conform to our dominant wind direction of 45 degree angles to fields.

Specifications for practices are based upon 5 tons an acre a year soil losses. This is considered by many research workers to be about the tolerable rate of soil loss, considering permanent damage to soil, loss of productivity, and injury to growing plants.


GRAND HAVEN SCHOOL DISTRICT
NATURAL LABORATORY
A PLACE OF PEACE FOR BIRDS AND BEASTS
FOR FLOWERS, FERNS, AND TREES
A SACRED SPOT OF NATURE RARE
TO LOVE, PROTECT AND CHERISH
TREAD LIGHTLY HERE, GIVE GENTLE CARE
THAT NONE OF IT SHALL PERISH
1962
ANON

(Upper l.)—Thousands of acres in western Michigan were marked by sand blowouts like this. (L. cen.)—Stabilizing beachgrass was planted in this pattern. (Low. l.)—Stump fence between houses from pine trees that grew here before cultivation and wind erosion stripped the land, now being occupied by new homes and beautiful lawns on stabilized soil. (Upper r.)—Forests—like these 14-yr.-old red pines—now grow in blow sand first stabilized by beachgrass. (R. cent.)—About 1 million Christmas trees have been harvested each year since 1945 in West Ottawa SCD. (Low. r.)—Truly "a sacred spot of nature rare today!"

In Western Michigan—

It's an Ill Wind That Blows No Good

By William M. Allred

LANDOWNERS and communities in western Michigan's Ottawa and Muskegon counties have damaging wind that used to sweep across their dune and muck lands to thank for much of the extra prosperity and more pleasant living they enjoy today.

It was the wind that prompted them to organize the West Ottawa and the North and South Muskegon County soil conservation districts in 1938 and 1939, as a cooperative last ditch stand in their still losing fight against the dunes marching inland from the eastern shore of Lake Michigan. Today, just 25 years later:

The dunes are covered with forests of marketable Christmas trees or tied down with sand-holding beachgrass; inland vegetable and other croplands are protected against soil blowing by conservation land use; land values in the dunes area are 10 to 20 times what they were; and people from nearby large population centers are moving in, bringing with them new homes, schools and churches, and industries, boosting local business generally, and stimulating recreational developments.

Between 1880 and 1890 most of Michigan's timber was cut. The slash and the remaining timber were burned, and the land was plowed for crops — including the land in sand dunes along Lake Michigan. After more than a foot of organic matter had disappeared quickly under cultivation, the sand began to blow.

During the dry thirties, the entire west side of Ottawa County became truly a desert on the march. As crops were blown out on the sandy area along the lake and the dunes covered the better soils farther and farther inland, merchants and other people began to suffer.

When Michigan enacted its soil conservation districts enabling act and the West Ottawa and Muskegon districts were organized, farmers and their families, teachers and pupils, civic clubs, and church groups all were among those that joined forces in working to stabilize the sand and plant trees. Stabilization of the raw sand dunes and blowouts was a necessity before critical areas could be restored to their safe and natural use for forest cover.

Of several methods for tying down the shifting sands tried by Soil Conservation Service technicians working with the districts, planting American beachgrass proved to be the most effective and economical. Dune areas, stabilized by beachgrass plantings, could be planted with pine trees as permanent cover within 2 to 4 years. More than 6,000 acres have been anchored with beachgrass in the three-district area. In addition, pine trees have been planted so far on about 70,000 acres.

The better quality, heavier sand and muck soils, which make up large areas a little farther inland and are used for growing a variety of crops, such as onions, celery, and other vegetables, also are highly susceptible to wind erosion; and a quarter of a century ago dust clouds on unprotected areas spread over crops, filled drainage ditches, limited visibility on highways, and seeped into homes. In this area, district cooperators are protecting their land with pine tree windbreaks, wind stripcropping, crop rotation with grasses and legumes, cover crops, and crop residue.

Here are some of the economic and other benefits people in these western Michigan localities are realizing from their wind erosion control programs:

Christmas tree production has become a big industry in Ottawa and Muskegon counties. In Ottawa County alone, there are 8,000 acres of Christmas tree plantings, and an average of 1 million Christmas trees are sold and moved out of the county each year. They wholesale at an average price of $1 each; and a large amount of labor is employed by the growers in planting, pruning, spraying, and harvesting the trees.

There also now is 25,000 acres of timber ready for thinning in the West Ottawa district. These forests will yield an average of about 5 cords of pulpwood an acre in the first thinning. In addition to the labor that is furnished to local people in cutting the pulpwood, an estimated $20 a cord more goes to labor in the mill.

Seventeen school forests have been established on public lands, as part of this district's program of teaching the youth of the community the importance of natural resources and their conservation. These school forests are used as outside classrooms for students of all ages. The soil conservation district board of supervisors administers all public lands in the county, and all of this land has been stabilized with beachgrass or pine trees. One 40-acre tract has been developed into one of the

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Director Elwin Woodard of South Muskegan SCD (r.) and Henry Dierking of SCS examine 1-yr.-old medium purple willow windbreak that helps protect cropland.

best field archery courses in the State.

When the district recently revised its program of work better to meet today's broadened land-use and related community conservation responsibilities and opportunities, it especially recognized the increasing importance that recreation is playing as a source of cash income for the farmer. The district board is working with the County Board of Supervisors and others with a view to acquiring additional lands that may be used by the public for recreation areas.

When the district was established in 1938, deer in the district was a rare sight. Today, it is estimated that the local deer herd numbers 3,000. Two hundred bucks were taken by hunters in 1963.

The multiple benefits accruing from sand blow stabilization in this area are attested to most convincingly in the greatly increased land values that have resulted in the West Ottawa County Soil Conservation District. In 1938, land here was selling for $5 to $10 an acre. The same land now is valued at $100 an acre!

Southeast Borrows From West To Fight Own Wind Erosion

By Walter S. Allen

FARMERS plagued by wind erosion in parts of the Southeast have profited from research and experience in the Great Plains and other western areas by borrowing conservation practices that now successfully control their own soil blowing.

Here, the destructive force of the wind has taken its heaviest toll in the Coastal Plain sections of the Carolinas and Georgia and in the north-central ridge and other sandy areas in Florida. Smoothly prepared fields of sandy dry soil, bare of living or dead plants, are most vulnerable. Farmers in these areas have reported that the wind-driven sand cut off young, tender plants at ground level, filled drainage ditches, and even blocked highways. In some cases, only sterile sand was left on formerly fertile fields.

In Hoke County, N. C., for example, wind erosion caused replanting of about 2,500 acres of cotton, 1,000 acres of corn, and 100 acres of tobacco in dry 1955 alone. Nearby counties in the Sandhill area reported similar damage. In South Carolina, a Marlboro County farmer had to haul 12 truck loads of sand out of his garden after a big blow in the likewise dry spring of 1963.

March and April have been the most critical months; but South Carolina and Georgia also have experienced wind damage in February and May.

State Conservationist T. S. Buie of the Soil Conservation Service, which gives technical help to soil conservation district farmers in planning their wind erosion control program in South Carolina, also reported, among other examples of damage, that spring winds filled a drainage ditch with sand three times on a Darlington County farm when the land was being prepared for planting, and that a county road running through this farm became impassable. SCS State Conservationist C. W. Chapman said wind erosion occurred primarily in late winter and early spring in scattered areas of the Coastal Plain soils of south Georgia. Unprotected loamy-sand

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and sandy soils are most susceptible to damage.

"To the farmers of the north-central ridge area of Florida, wind erosion long has been a serious problem," Florida State Conservationist J. W. Hammett of SCS explained. "Here, an intensive agriculture has been built on general farming of gently undulating deep, sandy soils. The same characteristics that make these well suited for cultivation also make them vulnerable to wind erosion. The loose, fine sand particles are easily lifted and carried by winds of medium velocity."

Wind erosion is widespread throughout Florida, wherever the fine-sand soils have been exposed to unrestrained seasonal winds by clean tillage. Soil blowing has troubled truck farmers in the sandy soils and muck soils of southern Florida. Recently, many thousands of acres in central and south Florida have been cleared of native vegetation and planted to citrus. Hammett said failure to provide protective cover on many of these areas has resulted in serious wind erosion problems.

Farmers in the four States have successfully used the more established control measures such as windbreaks of trees and perennial plants and wind striperopping. In recent years, they also have found some of the newer practices to be effective. These measures include mulch tillage, sod-based rotations, perennial grass, and planting some fields entirely to small grain.

SCS State Conservationist J. P. Kuykendall outlined the principal control steps taken in North Carolina:

"Slopes and other critical areas subject to severe wind damage are most effectively controlled with perennial vegetation. They will serve as intermediate windbreaks and as guides for rotated strips. Some of the good plants are sericea lespedeza, shrub lespedeza, kudzu, and multiflora rose. After the critical areas are protected with per-

Sand blown onto road from unprotected Darlington County, S. C., cropland in one 1961 windstorm completely blocked traffic.

This sand was all that was left of fertile topsoil blown from adjacent Gilchrist County, Fla., field in a 2-day windstorm.

Strip rotation of peanuts and rye in Sumter County, Ga., is representative of wind erosion control measures used in Southeast.

ennials, the cropping system followed is very important. The arrangement of the crops should be in strips across the prevailing winds on the nearly level land and on the approximate contour on sloping land."

In South Carolina, in addition to windbreaks and wind stripcropping, mulch tillage and cover crops have proved to be the most effective control measures in most sections of the State. Mulch tillage and cover crops also are being used in Georgia and Florida along with other protective measures.

As in other sections of the Nation, some more seriously affected, the never-ending battle of man against the wind continues in the Southeast. The winds will come again this spring. Damage will be done, but conservation practices will reduce the losses substantially.

"What Happened to the Shelterbelt?"

By A. E. Ferber

"WHAT'S happened to the Shelterbelt Project that we heard about back in the thirties?" This question is asked frequently, nearly 30 years later.

In 1935, President Franklin D. Roosevelt authorized the Prairie States Shelterbelt Project tree-planting program for the Great Plains. It was started to put men to work on projects that might help ameliorate the effects of the disastrous drought then building up to its "dust bowl" peak in the 10-State region.

Plains farmers and ranchers had been planting trees successfully, even before tree-claim homesteading days in the 1870's, but they were mainly for farmyard and livestock protection. The new program called for tree belts along the windward sides of entire fields, to protect soil and crops from wind-blowing damage.

During the 8 years (1935-42) that the project operated under the shelterbelt name, more than 200 million seedling trees and shrubs were planted by Works Project Administration workers and Civilian Conservation Corps Camp boys under supervision of the Forest Service on 30,000 farms distributed over 6 States. The Prairie States shelterbelt plantings exceeded 18,500 miles in total length and occupied about 238,000 acres in the Dakotas, Nebraska, Kansas, western Oklahoma, and the Texas Panhandle.

The trees and shrubs were planted in strips bordering cropland—not as a solid forest—and usually along the north, west, or south field boundaries, crosswise to the prevailing wind direction. Most windbreak strips were made up of 10 to 12 rows 10 feet apart. The tall trees were in the middle, flanked by bushy type trees, shrubs, and evergreens. Fruit- or nut-producing species often were included for wildlife foods, as the shelterbelts were designed for multiple purposes, with some 40 to 50 locally adapted species used.

Major areas of shelterbelt planting in the Great Plains region by the Prairie States Forestry Project during 1935-42.—U. S. Forest Service.

What is the present status of the original shelterbelt and other tree wind barriers subsequently planted in the Great Plains? Successful tree planting in this normally almost treeless region of low rainfall is difficult even under favorable climatic conditions. Consequently, quite a few of the earlier plantings failed, even though many farmers hauled precious water in barrels and doled it out to their struggling tree seedlings.

A survey made in 1954 showed that 73 percent of the old shelterbelts were still in fair to good condition. But the severe droughts of the 1950's caused many plantings to die out on upland soils in the Southern Plains, while some of those in the Central and Northern Plains have lost their effectiveness through livestock grazing and general neglect. Many of those remaining have been overrun by sod and some need renovation. Present observations indicate that, even so, at least half of the original shelter-

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These single-row pattern field windbreaks planted in North Dakota in the thirties are the type being planted today.

belts are still effective.

Lessons learned from this undertaking, combined with knowledge gained by other Federal and State agencies and landowners themselves through subsequent experience, have enabled present-day Plains tree planters to do a better and more scientific job. The shelterbelt project verified the experiences of early settlers that trees can be grown successfully in this region during most years. That is, if such precautions are taken as careful selection of good quality seedlings adapted to the local soil and climatic conditions, adequate ground preparation, proper planting, and early cultivation to control moisture-competing winds, and care as long as the trees live.

Soil conservation demonstration projects set up by the Soil Conservation Service in cooperation with the States during the mid-thirties also were proving grounds for tree windbreaks in some areas, as they were for many others of our modern cropping, tillage, structural, and other conservation measures.

The planting of field windbreaks was stepped up further when farmers and ranchers began in 1937 to organize soil conservation districts authorized by State laws, and was greatly accelerated after World War II ended in 1945. Today better than 95 percent of the arable land in the Plains lies within these districts.

Field windbreak planting has been most active in the eastern and central parts of the Dakotas and in central Nebraska and Kansas; but these windbreaks also are used to a lesser degree in other parts of the Plains where soil blowing is a problem. The planting of farmstead and feedlot windbreaks also has increased tremendously, during the past decade, except for areas in the Rockies, fringes along the eastern border of Kansas and Oklahoma, and most of Texas. Some wildlife plantings are being made regionwide.

It is estimated that between 1935 and 1963, the last planting season, approximately 666,000 acres of trees—benefiting several million acres of cropland and hundreds of thousands of farmsteads and feedlots—had been planted in the Great Plains with the help or sponsorship of public agencies. This total planting has been made up of the 238,000 acres in the 1935-42 shelterbelt program and 428,000 acres planted through these other programs: By CCC camps under SCS direction, 14,000 acres; in SCS demonstration projects and soil conservation districts between 1935 and 1954, 179,000 acres; and by district cooperators from 1955 to 1963, 235,000 acres.

Approximately 35,000 miles of field windbreaks are included in the 428,000-acre other-than-shelterbelt total, and about three-fourths of the overall total acreage was in farmstead and livestock windbreaks.

During this same period, farmers and ranchers on their own initiative planted another 200,000

A field windbreak planted in 1941 by the Civilian Conservation Corps in North Dakota, which now leads in Great Plains tree planting.

Tree belts near Duncan, Nebr., which were planted in 1939 and 1947 by Prairie States Forestry Project and by owner Emil Blaser.

acres or so, to a grand estimated total of 866,000 acres. Figuring 700 or 750 seedlings were planted, on the average, to the acre, something like half a billion trees and shrubs went into the ground during the 28-year Great Plains tree-planting activity from 1935 to 1963.

Soil conservation districts in the Plains are now planting annually approximately 13,000 acres of farmstead windbreaks, 4,000 miles of field windbreaks, and 1,000 acres of miscellaneous windbreak areas. North Dakota landowners alone plant more than 3,000 miles of field windbreaks a year, plus comparable amounts of farmstead windbreaks. Several district-owned tree nurseries in North Dakota grow seedlings as a service to their cooperators. Most seedlings Plains-wide, however, are purchased from State (Clark-McNary) and private nurseries. Plains soil and water conservation districts now own and operate around 450 tree planters, 250 mechanical weeding implements, and 40 chemical sprayers for controlling weeds in newly planted windbreaks. Some districts have provided seedling storage facilities. Local people are employed to operate the equipment, and some windbreaks are planted and weeded on a custom basis, to ease landowners' workload during the cropping season.

Conservation and forestry technicians feel that many more thousands of acres of windbreaks could be used advantageously in the Plains—some estimate as high as a million acres. In addition to tree-growing services they get through their soil and water conservation districts and from the SCS, landowners are helped by agencies such as the Extension Service, State forestry organizations, the Agricultural Conservation Program, the State Experiment Stations, and the Federal Housing Administration, as well as by research workers of the Agricultural Research Service and the Forest Service. Through all these means together the Plains region is getting practical and effective windbreaks, tailored to the needs of the landowners.

Growing field windbreaks is tied in with landowners' overall conservation plans for controlling wind erosion. Windbreaks are not a cure-all, but trees have a place on most Plains farms and ranches, when they are planted in a complete, patterned system of narrow strips, usually about 20 to 30 rods apart, and in combination with other conservation practices. Most field tree barriers are in the 1- to 3-row range; because observations have shown that a relatively wide field windbreak protects no more cropland—for a distance up to 20 times its height—than does a single-row barrier of closely spaced plants, which costs less and takes up less land.

Thousands of today's Great Plains farmers and ranchers are enjoying the benefits of their field and farmstead windbreaks. They have helped reduce soil blowing, and they hold snow on the fields for crop moisture during dry years. Many landowners also feel that they increase cropping efficiency during some years. Others value the additional wildlife and bird habitats that windbreaks provide. Farm and ranch owners welcome the comforts and economic benefits provided by their farmstead and feedlot windbreaks during cold, blustery weather, and they appreciate the snow control they give. As one long-time resident put it: "They make a home instead of just a place to live."

Windbreaks Pay Off

How farmstead windbreaks make money for Nebraska and Kansas farmers was confirmed in a survey reported by District Extension Forester John P. Slusher of Kansas State University.

Of 201 Nebraskans answering the question, "Can we put a dollars and cents value on farmstead windbreaks?", 86 livestock feeders placed their annual savings at more than $800; 62 livestock breeders reported more than $500 in annual savings; 53 dairymen showed yearly savings of more than $600; and farmers with fruit and vegetable gardens credited $80 to $100 a year return to better quality and quantity of their windbreak-protected crops. A few Kansas farmers surveyed, feeding some 100 cattle, reported their average savings as $500 a year as a result of having farmstead windbreaks.

Cover Crops Lick Wind Erosion For Red River Valley Farmers

By Nels Snustad and H. A. Tvedten

SUGAR-BEET and small grain farmers are turning the Red River Valley of the North in Minnesota and North Dakota green again by growing cover crops on fields that formerly were clean tilled and regularly swept by wind erosion.

Principal crops in this "Nile of the North American Continent" are wheat, oats, barley, potatoes, flax, soybeans, sugar beets, and truck crops. With its seemingly endless flatness and deep, dark, heavy, lacustrine soils, the valley would seem to have no problems of land management. Yet there actually are many problems. Among them are lack of adequate drainage, soil compaction, salt concentrations, nutrient deficiencies—and serious wind erosion under intensive tillage management systems such as summer fallowing for sugar beets.

Red River Valley farmers have been working since 1945 through their locally formed soil conservation districts, with technical help from the Soil Conservation Service, to lick the wind erosion problem. Much success has been achieved with wind stripcropping, field windbreaks, stubble mulching, crop residue use, and rough tillage in much of the valley, but the problem was not so easily solved on sugar beet land.

Wind stripcropping and field windbreaks at intervals close enough to control soil blowing were not acceptable to farmers operating large and costly beet production machinery. Summer fallow the year before sugar beets gives highest yields but also leaves the ground open to wind erosion.

As early as 1941 a few farmers tried cover cropping; but it was not until after a meeting held at Moorhead in the fall of 1958 by representatives of the beet company, the SCS, and the Agricultural Research Service that it was decided to push cover cropping through the soil and water conservation districts. In the four crop seasons since, more than half of the 120,000 acres of sugar beets on 1,316 farms in the 11-county Red River Valley area in Minnesota and North Dakota have been seeded regularly to a cover crop; and this practice is spreading.

Oats or barley is seeded on summer-fallowed land in late August or the first week in September. Weed control sometimes is necessary. Flax can be used for cover cropping, but it is hard to get an even stand if the surface is dry at seeding time.

Farmers have found it is better to make solid cover seedings, because the wind often blows soil from bare strips onto the adjoining grain strips in strip seedings and makes it hard to obtain an even stand of beets.

Usually there is some seedbed preparation in the spring; but sugar beets can be planted in the cover crop residue without any working, and a little debris in with the crop after planting may save it from damaging winds.

Farmers using cover cropping generally agree with Hugh Trowbridge, who cover crops about 220 acres every year near Comstock, when he says:

"I would not have any summer fallowed land without seeding it to a cover crop if it was possible

Cooperator Maurice Borgeson (r.) in Walsh County (N. Dak.) SCD uses combination of corn buffer strips and cover crop to control wind erosion along Red River Valley's old Lake Agassiz beachline. Abner Lee of SCS (l.).

The authors are area conservationist, Fergus Falls, Soil Conservation Service, and manager, American Crystal Sugar Company, Moorhead, both of Minnesota.

Drainage ditch filled by soil blown in from unprotected land in Red River Valley in Minnesota.

to get it in."

Merlyn Valan, who normally cover crops 200 acres a year south of Moorhead, gives some specific reasons for using the practice:

"It cost me $3,000 to clean out my field drainage ditches last year, because of not seeding a cover crop in the fall. Besides, I had to pay my share for cleaning out the county ditches. This money could have been saved had I seeded cover crops as I normally do. I lost a lot of good dirt too."

And Carl Ehlert, who uses a cover crop on 70 acres in Wilkin County, puts it this way:

"I like cover cropping because it holds soil in place and soil fertility is not lost."

Pres. Hugh Trowbridge of Clay County Sugar Beet Growers Assn. in frozen oats cover.

Wind Erosion Growing Menace To Illinois Farms and Roads

By Homer M. Kuder

FARMERS in central and northern Illinois are using conservation measures in battling the new menace of wind erosion on their rich prairie lands while local and State road and other officials still are counting the cost to the taxpayers of soil blowing damages suffered in late years.

For years they felt that nothing could happen to this good level land. But they have learned that even though wind erosion lies almost dormant some years, it may strike like a plague another year. It struck central Illinois in April 1956, for example, and again even harder on March 27, 1961.

On that day a huge cloud swept across the flat prairie of central Illinois drifting soil like snow. On Illinois Route 116 near Pontiac in Livingston County, motorists turned on their headlights to see through the darkness; and snow plows had to clear off the black soil to allow traffic to move. The whole area looked like a scene from the "Dust Bowl" during the thirties.

Damage was statewide. The soil blew wherever level land had been left bare by fall plowing. The real dollar loss was hard to determine. When this question was put to George Caveziel, Livingston County Superintendent of Highways, he answered:

"This '61 storm cost us thousands of dollars. We just completed work restoring our county roads in 1963. First the dirt was too loose—worse than sand to move—then after it rained it was too sticky and soft. It cost us $100 to $200 a mile just to clear out ditches."

The cost to townships varied, hitting flatter townships harder. Most townships did not receive extra money to cope with the problem; so the big loss was in terms of poorer roads and wetter fields next to the roads. Frank Berberich, former township road commissioner in Collum, said:

"We cleaned out the worst ditches as best we could the first year—many haven't been cleaned out yet."

State highway officials reported that routes most severely damaged cost up to $2,500 a mile to completely renovate.

"We have just now completed cleaning up the highways in this section of the State afer the '61 duststorm," Carl Patelli, State Highway Maintenance Engineer at Pontiac, said last fall. "It was especially noticeable that blow dirt on our roads came from land that was fall plowed."

The author is assistant State conservationist, Soil Conservation Service, Champaign, Ill.

Farmers' share of the wind erosion costs have been heavy. First of all, they lose the most fertile part of their soil, the topsoil testing high in lime, phosporous, and potassium. A more immediately measurable cost is that of cleaning out filled-in drainage ditches and waterways, and the reduction in yields as a result of impaired drainage.

"Shortly after the '61 big blow, I was called to blade out a grassed waterway built just the year before," Berberich recalled. "The waterway was filled to a depth of a foot and a half. This cost the farmer a day's work with a motor grader."

The actual cost was much more, considering that waterways normally last 10-15 years without being reworked.

Ray and Bob Fox of Saunemin are representative of those who have stopped wind erosion damage.

"We don't get any blowing damage on our place," they will tell you. "We developed a conservation plan and carried it out several years ago in cooperation with the Livingston County Soil Conservation District. The Soil Conservation Service helped us install a cropping system with about one-fourth of our land in meadow. With the plan we also installed terraces, waterways, and multiflora rose as a hedge fence. The rose fence is ideal as a windbreak."

Multiflora rose fence near Dwight, Ill., is effective wind erosion barrier and welcome home for song birds and game; and stalks left after corn is picked also give land good protection.

"When we developed the plan," Ray Fox said, "we were most concerned about water-caused erosion on our slightly rolling soils, but now it seems like wind erosion is bothering our neighbors more than water erosion. Our plan has licked both problems. I believe elimination of early fall plowing has had the most effect. We sometimes plow very late in the fall now and have no trouble."

The SCS advised Livingston County District farmers who feel they must fall plow to leave barriers of unplowed strips with standing stubble, 10 or 15 feet wide every 150 feet or so. Fall-seeded oats on plowed land also provides winter cover without interfering with spring work. Rough plowing with some crop residue left above ground helps, if plowing is not done too early in the fall.

If wind erosion continues to plague Cornbelt farmers on the heavy black soil of central Illinois, they eventually may have to adopt stripcropping, field windbreaks, standing crop residues, and cover cropping practices, which have proved so useful in sandy areas, in order to offset the hazards of fall plowing.

This fertile soil blew from plowed field in left foreground, but no soil blew from unplowed field beyond in "big blow" of March 1961.

Here's how the roadside stretch looked 2 years later after the blow soil was removed from road ditch along Illinois Route 47.

Conservation Showplace Farm Not Bothered By Drought Now

By Gilbert G. Bierwagen

The Rittbergers are happy that newly planted windbreak trees are thriving after surviving dry 1960 and 1961.

TO see Rudolph Rittberger's South Dakota farm today one would find it difficult to believe that 30 years ago its principal "crop" was Russian thistle and that the drought of the 1930's almost drove its owner out of farming.

Today, the 320-acre farm on Crow Peak Bench above Spearfish at the northern edge of the Black Hills is a profitable showplace of conservation farming. The soil in the fields of alfalfa, barley, corn, and wheat is among the most productive in the area and has been for years. Rittberger rode out the droughts since the 1930's with comparatively little trouble.

"The fact is," Rittberger says, "it was drier here in 1959-61 than it was in the thirties, but we got through it okay. We even put in a good-sized windbreak despite the dryness."

To do all this would have been unthinkable 30 years ago. Just to hold on through the "dirty thirties" was difficult enough—and impossible for a good many of Rittberger's neighbors.

Rittberger came here in the 1920's as a student at what is now the Black Hills Teachers College. He married the young lady who cooked the meals at his college boardinghouse, and in 1928 the couple settled on an 160-acre tract just above the school. He was a hard worker and had natural ability at farming that were just beginning to pay off when the big drought hit.

The only thing Rittberger and his neighbors could grow was Russian thistle, and even that had a hard time surviving the dust that buried fields and fences, and pushed high against farm buildings. He watched sadly as neighbors pulled up stakes and headed for greener fields. Rittberger himself had to sell off his machinery and stock to hold on. By 1938, however, he already had recovered from the drought sufficiently to buy 80 more acres; and the next year he bought another adjoining 80 acres, bringing his farm to its present size.

When the Lawrence County Soil Conservation District was formed, in 1943, Rittberger saw an opportunity to complete the drought-proofing task he couldn't finish by himself. He became one of the first cooperators and has systematically applied recommended land-use and water-management measures with Soil Conservation Service technical help.

First was to divert a runoff channel that had cut one of his best fields in two, and then shape the 48 acres so he could work it on the contour. Other measures have included using a conservation crop rotation and crop residues; grassed waterways, terracing, and shaping another 65 acres of cropland; planting a shelterbelt around the farm buildings—the last section of which was planted during the recent drought—and building two floodwater and erosion control dams.

These structures feed additional water to springs below and have encouraged Rittberger to plan a

Alfalfa hay being windrowed for baling in October 1963 on Rittberger farm, on which terracing and contour stripcropping have greatly reduced soil loss.

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permanent lake for stockwater, wildlife, and recreation.

Results of this Black Hills farmer's conservation work are told most dramatically in his ledger book: He has boosted income from all crops from one-third to double in some cases, and his land valuation has more than tripled.

He has only had to buy 6 tons of hay since the thirties, even though he has doubled his herd to 22 stock cows, 8 stock heifers, and 2 milk cows. The last 3 years he has just let the hay pile up in the fields for feed during the drought. He also is raising a few turkeys.

Rittberger says conservation has made the job easier and his operations more stable, and has almost eliminated any cause for apprehension he might have over the weather. Conservation farming also has enabled him to provide wildlife with additional shelter and food—an achievement close to his heart.

For years, he has planted most of the tree windbreaks and shelterbelts in the Lawrence County district and has done conservation work for neighboring districts as well. He will go anywhere, anytime, to convince or help convince farmers and ranchers of the benefits of conservation.

Rittberger's conservation work has won him wide recognition. He was second in the Greater South Dakota Association's first-year "Soil and Moisture Achievement Contest" in 1951 and first the next year. He has been named outstanding farmer in Lawrence County several times in the annual Goodyear Soil Conservation Awards Program. And a picture of his farm took first place in the 1963 annual photo contest of the South Dakota Association of Soil and Water Conservation Districts.

The Rittbergers' place is always a main stop on any conservation tour in the area. The Teachers College also uses the farm as a field training site each summer during its conservation training courses.

Colorado Farmers-Ranchers Take Wind Out of Drought

By Mott R. Duncan

FARMERS and ranchers may not be able to change the long-standing reputation of some eastern Colorado areas for proneness to drought but they have succeeded in taking much of the wind damage out of it through conservation treatment and management of their crop and pasture lands.

The drought reputation, gained in the 1930's, was revived in the 1950's; and some landowners, in Baca County in the State's southeastern corner, say the 1962 and 1963 seasons were just as dry, if not drier.

But, although the wind has blown in winter just as hard as before and four-fifths of the dryland crops failed to mature, there was a difference in the seasons just passed: the land stayed put. It remained ready to produce when good moisture returns. That's because a rapidly growing number of farmers and ranchers in eastern Colorado's soil conservation districts are working to see that drought doesn't mean disaster again. A key weapon in their modern battle against drought is the use of crop residues on cropland and improved grass and other cover on range. Stubble mulch is basic in cropland conservation in any year. It is particularly needed in drought.

The short wheat crop in Baca County in 1963 produced less residue than average, and conservation farmers set out to manage carefully the residue they did have. Many planted quick-growing cover crops to protect the land. Some, as an emergency step, resorted to deep chiseling to bring heavier soil to the surface, leaving a cloddy condition that resists wind erosion. Other soil-protecting and moisture-conserving practices, applied on large cropland acreages over the past 2 or 3 years, that helped included terracing, contour farming, stripcropping, and crop rotation.

This is just one of the good irrigated pastures from which Leon Mills has removed threat of erosion damage.

Year-old grass planting thrives on hazardous cropland converted to rangeland by Forrest Homsher (l.).

Many ranchers, meanwhile, reduced their herds, and two moved entire herds to protect their graz-

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This bare field, remindful of "dust bowl" days, contrasts sharply with neighboring land now protected by conservation practices.

Heavy stubble protects the land of Bernard Neill (l.) near Springfield, Colo., and of his Southeast Baca SCD neighbors. Mott Duncan of the SCS (r.).

ing land. Other practices Baca County ranchers had been using for years which paid added dividends in the emergency included deferred grazing and pasture rotation, cross fencing, brush control, reseeding rangeland, and stockwater ponds spaced to insure uniform grazing.

Much of the recent conservation work in the three soil conservation districts that serve Baca County —Two Buttes, Western Baca, and Southeastern Baca—has been carried out with the aid of Federal cost-sharing and technical help of the Soil Conservation Service available through the Great Plains Conservation Program. Through it farmers and ranchers are planting dunes and blowout areas—land believed to have been destroyed by drought 30 years ago—to trees, shrubs, and other cover.

Forrest Homsher and others tied marginal cropland down by seeding converted cropland to grass under this program; and Roy Hanes, first in the area to enter the Great Plains program, in 1958, decided to sell most of his livestock and rebuild his herd as he rebuilds his range.

Fred Miser, who has ranched in the area for nearly 40 years, cut back his herd by 100 head of cows in August. J. M. Welborn is one who moved his herd to the northern part of the State. George Lapel established a good grass cover on his 500 acres of rangeland after controlling moisture-hogging sagebrush with chemical spraying. Leon Mills improved 220 acres of irrigated pasture, virtually eliminating the danger of wind and water erosion.

Bernard Neill and Clarence Seawright are among those who place great weight on stubble mulching. Seawright uses it on 2,000 acres of cropland, virtually all of which is terraced to make the most of the moisture available.